

GYMNOTHORAX PARINI, A NEW SPECIES OF
MORAY EEL (TELEOSTEI: MURAENIDAE) FROM
WALTERS SHOALS, MADAGASCAR RIDGE

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Abstract. — *Gymnothorax parini* is described from 19 specimens collected in shallow water (18 m) at Walters Shoals in the southwestern Indian Ocean. It is distinctive in having a wide bright white margin on the dorsal, caudal, and anal fins; a long anterior nostril tube that reaches or passes the edge of the upper lip when depressed ventrally; and at least half the posterior nostril located anterior to the anterior margin of the eye. It resembles several other species found around islands in the subtropical zone of the southern Indo-Pacific, but differs from all of them in color pattern, number of vertebrae (143–152), and position of the posterior nostril.

During Cruise 17 of the Soviet oceanographic research vessel *Vityaz* in December 1988, the shallow-water fish fauna was sampled with traps, fish trawls, Sigsbee trawls, and by hook and line fishing (Collette & Parin 1991). Among the fishes collected were a new species of *Scorpaenodes* described by Poss & Collette (1990) and a new moray eel, which is described herein. Walters Shoals, an isolated, submerged, oceanic mountain-top that rises to within 18 m of the surface, is located 400 nautical miles south of Madagascar and 600 nm east of South Africa at 33°09'–16'S, 43°49'–56'E. The purpose of this paper is to describe the new species so that the name is available for subsequent analysis of the Walters Shoals fish fauna and the other West Wind Drift islands and seamounts, and to compare it with other similar species of the genus *Gymnothorax*.

Materials and methods. — Counts and measurements follow Böhlke (1989). Material is deposited in collections of the National Museum of Natural History, Washington, D.C. (USNM); Academy of Natural Sciences of Philadelphia (ANSP); Australian Museum, Sydney (AMS); Natural History Museum of Los Angeles County (LACM); and Shirshov Institute of Ocean-

ology, Moscow (IOAN). Other institutional acronyms follow Leviton et al. (1985).

Gymnothorax parini, new species
Figs. 1–3

Holotype. — USNM 307751 (female, 538 mm TL): western Indian Ocean, Walters Shoals; depth 18 m; *Vityaz* Cr. 17, sta. 2751, BBC 1923, 22 Dec 1988.

Paratypes. — All from Walters Shoals, 18 m, *Vityaz* Cruise 17, December 1988. ANSP 163850 (2, 545–655), same data as holotype. USNM 307749 (2, 480–590), *Vityaz* 2695a, BBC 1906, 13 Dec 1988. USNM 307750 (1, 575), *Vityaz* 2715, BBC 1914, 16 Dec 1988. USNM 307752 (4, 588–650), IOAN uncat. (3, 573–720), AMS I.28155-001 (3, 585–665), and LACM 44749-1 (3, 665–695), *Vityaz* 2683b, BBC 1901, traps, 11 Dec 1988.

Diagnosis. — *Gymnothorax parini* is distinguished from other species of the genus by the following combination of characters: anal fin with bright white distal margin and dark, unpatterned basal portion; white margin conspicuously continuous around caudal fin and on to dorsal fin, somewhat less intense anteriorly; anterior nostril very long,

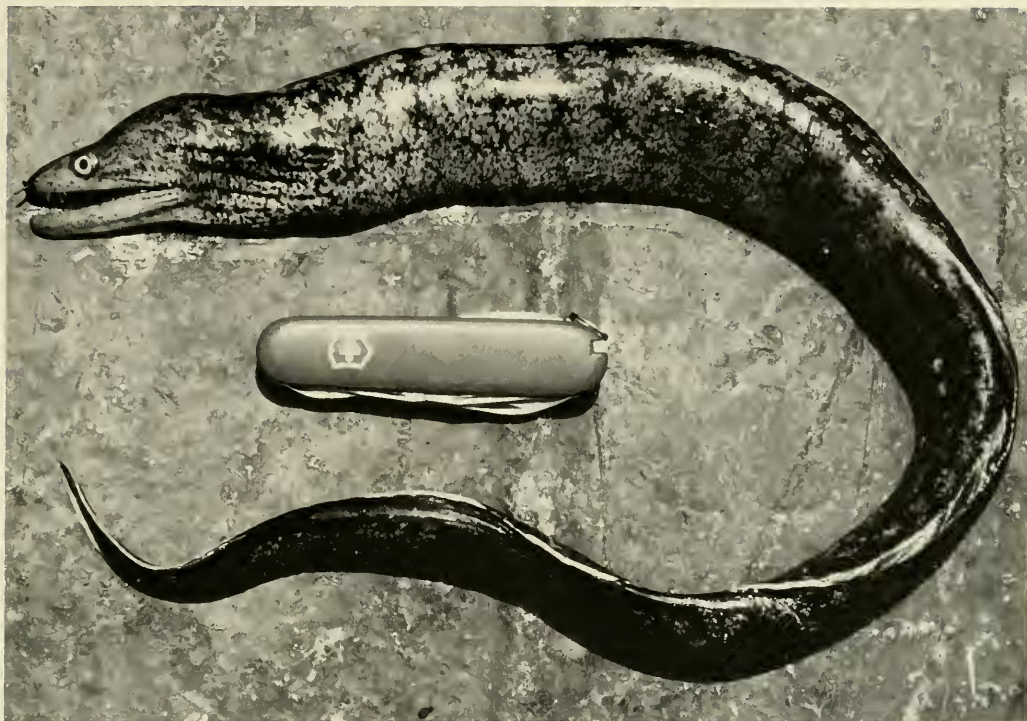


Fig. 1. *Gymnothorax parini*, new species, Vityaz sta. 2683. Knife is 90 mm long. (Photograph produced from color slide used for color plate Ia in Collette & Parin 1991.)

reaching upper lip when depressed ventrally; at least half of posterior nostril located anterior to vertical line through anterior margin of eye; body dark with irregular light markings; snout moderately long; all teeth uniserial; and mean vertebral formula 4-56-147.

Description.—Total vertebrae 143–152, \bar{X} = 147 (n = 19), predorsal vertebrae 3–5, \bar{X} = 3.8 (19), preanal vertebrae 53–58, \bar{X} = 55.7 (19). Vertebral counts for holotype 4, 58, 151. Pores: branchial 2 (13), mandibular 6–7 (16), infraorbital 4 (16), supraorbital 1+2 (16). Teeth: upper jaw 6–18 (19), lower jaw 10–17 (19), median intermaxillary 1–4 (19), vomer 4–14 (16).

Proportions as % of TL: preanal 43.2–46.6 (19), predorsal 9.3–13.0 (15), head 12.4–14.7 (18), depth at anus 4.5–6.1 (16). Of head length: snout 19.1–23.3 (18), eye 7.7–11.2 (18), interorbital 10.3–14.0 (18),

upper jaw 41.2–52.7 (18). Of upper jaw: snout 41.0–47.2 (19).

Body moderately elongate, typical of *Gymnothorax*, with anus slightly before midbody. Head and snout moderately elongate, jaws close completely. Dorsal fin origin immediately posterior to occiput, well anterior to gill opening. Eye moderate in size, located approximately over middle of upper jaw. Fins relatively low, dorsal somewhat higher than anal. Anterior nostril long and tubular, when depressed ventrally reaches or passes edge of upper lip. Posterior nostril without prominent raised rim, located over or slightly anterior to level of anterior margin of eye, at least half of nostril anterior to vertical line with anterior margin of eye.

Pores in lateralis system small and inconspicuous and arranged in typical *Gymnothorax* pattern (Fig. 2). Two in branchial section of lateral line, anterodorsal to gill

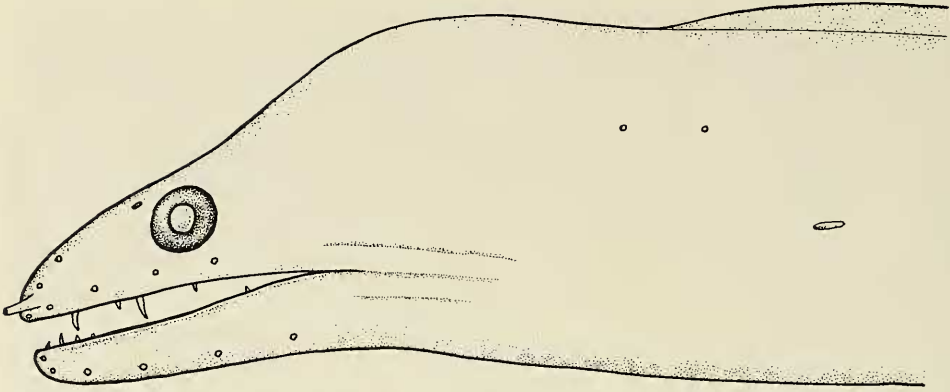


Fig. 2. Lateral view of head of holotype of *Gymnothorax parini*, new species (USNM 307751, 538 mm TL) to show cephalic lateral line pores.

opening. Six pores in mandibular canal (one specimen with seven on one side), all anterior to rictus. All four pores in infraorbital canal located along upper jaw between anterior nostril and vertical with posterior margin of eye. Three supraorbital pores: one (ethmoidal pore) at tip of snout on edge of upper lip, one adjacent to base of anterior nostril, and one posterodorsal to anterior nostril.

All teeth smooth, without serrations of any kind (Fig. 3). Lateral teeth in upper jaw narrowly triangular, slightly compressed, somewhat recurved, and uniserial; maxillary and intermaxillary series confluent, without obvious demarcation. Peripheral intermaxillary teeth increase in size from anterior to posterior; anterior maxillary teeth approximately same size as posterior intermaxillary teeth, becoming progressively smaller posteriorly and also somewhat more steeply inclined in posterior direction. A few tiny teeth set immediately before and/or behind large intermaxillary teeth. One to four large, slender, sharply pointed, depressible fangs on midline of intermaxillary plate, increasing in size from anterior to posterior. Teeth in lower jaw similar in size and arrangement to those of upper jaw, largest anteriorly and decreasing in size posteriorly;

a few tiny teeth set between large anterior teeth. Vomerine teeth small, triangular, pointed, mainly uniserial but occasionally one or two teeth displaced to side. Clear difference between males and females in number of teeth (Table 1), with males having fewer upper-jaw, lower-jaw, and median intermaxillary teeth.

Ground color in alcohol dark brown, almost black, overlain with irregular, light brown markings with erratic borders and mottled within by darker brown. Intensity and extent of light markings variable; some specimens nearly uniformly black, others with extensive light areas, but overall impression dark with light markings. Pale areas sometimes form irregular bars, sometimes snowflake- or lichen-like patches. Head usually lighter than body, without patchwork pattern of light markings, often irregularly mottled with darker brown. Anal fin marked conspicuously with bright white margin, which has a bluish cast in life; basal part of fin uniformly dark brown or black, without markings. Dorsal fin colored similarly, but narrower white edge tends to be interrupted anteriorly in smaller specimens; basal part of dorsal fin dark, but some light markings encroach upon it from body. White margin conspicuous around caudal fin. Skin

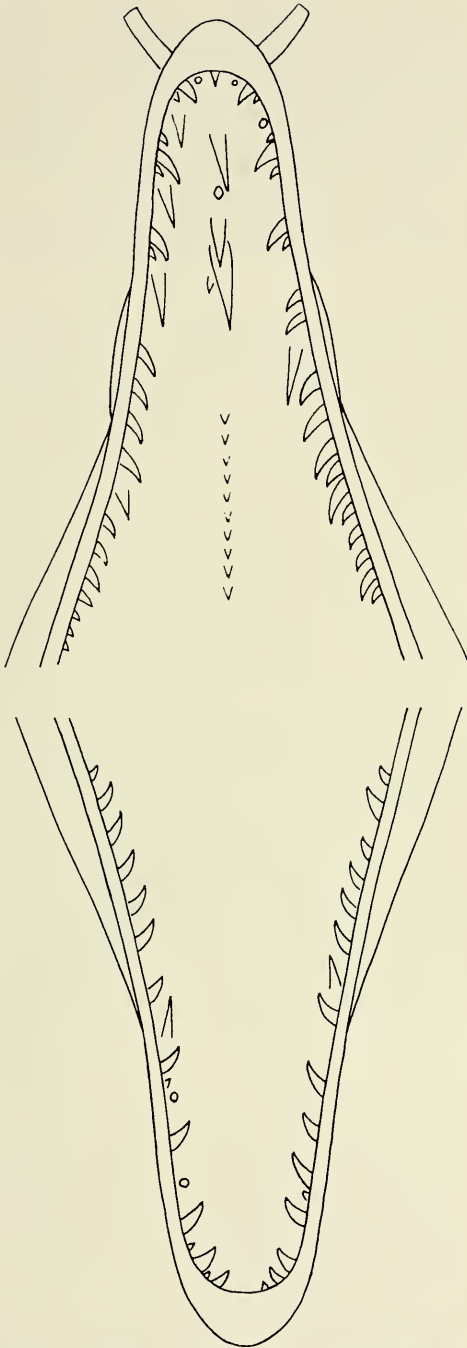


Fig. 3. Dentition of holotype of *Gymnothorax parini*, new species (USNM 307751, 538 mm TL).

Table 1.—Number of teeth in male and female *Gymnothorax parini*, expressed as total number, right + left, in upper and lower jaws (number of specimens in parentheses).

	Upper jaw	Lower jaw	Median intermaxillary
Females	30–32 (5)	29–32 (4)	3–4 (5)
Males	19–26 (8)	24–30 (7)	1–2 (8)

immediately around gill opening tends to be dark, but without conspicuous spot around it. Some dark pigment at corner of mouth, but not forming a conspicuous spot. Sensory papillae on head small, each set in a tiny dark spot, forming inconspicuous pattern of rows.

Sex and sexual dimorphism.—Of the 19 specimens of *Gymnothorax parini*, five, including the holotype, are clearly females (538–650 mm TL), eight are males (480–720 mm), and the sex of three was not determined. Although the ovaries are enlarged and the eggs conspicuous, none of the females is in spawning condition. At least four other species of *Gymnothorax* show a similar sexual dimorphism in the number of teeth as reported here for *G. parini*: *G. richardsoni* (Hatooka 1986), *G. enigmaticus* and *G. cf. monochrous* (M. A. Gibbs, pers. comm.), and *G. chilospilus* (D. G. Smith, work in progress). Hatooka also reported dimorphism in the dentition of two species of *Echidna*, and Gibbs has found another case in *Enchelycore schismatorhynchus*. Sexual dimorphism in tooth number may be widespread among morays and deserves further study. In the case of *G. chilospilus*, the female tooth pattern is also the juvenile pattern; the males change at maturity. With material available, we cannot determine whether *G. parini* follows the same pattern.

Aberrant specimen.—Of the 20 specimens of *Gymnothorax* collected at Walters Shoals, one (USNM 307753, Vityaz station 2695) stands apart from the others in sev-

eral ways. The most striking difference is the low number of vertebrae, 4-52-132. The total is 11 vertebrae fewer than for any of the *G. parini* and 15 fewer than the mean value for 19 specimens. If an eel loses part of its tail, it will regenerate a caudal fin, but this new structure never looks exactly like the original. If this specimen had lost 10-15 caudal vertebrae, it would be obvious from the radiograph, but this specimen shows no evidence of a regenerated caudal fin; the entire caudal skeleton appears perfectly normal. The specimen further differs from the others in color. Whereas *G. parini* were very dark, nearly black, when freshly collected, this specimen was distinctly brown. Even in preservative this difference is apparent. In addition, unlike in *G. parini*, there is a small but distinct dark spot around the gill opening, and the grooves around the neck and throat are streaked with darker brown. Finally, the upper jaw length and interorbital width are slightly higher than comparable values noted in *G. parini*, and the snout length as percent of upper jaw length is less in this specimen.

We do not know how to interpret this specimen. It is sufficiently distinct from the others that we have excluded it from the type series, yet with only one specimen we hesitate to describe it as a second species. We leave the problem unresolved for the time being and provide some counts and measurements: USNM 307753, male, 570 mm TL, preanal 265 mm (46.5% TL), predorsal 65 mm (11.4% TL), head 76 mm (13.3% TL), depth at anus 34 mm (6.0% TL), snout 16.3 mm (21.5% HL, 37.9% upper-jaw length), eye 8.2 mm (10.8% HL), interorbital 11.1 mm (14.6% HL), anterior nostril 3.7 mm (4.9% HL), vertebrae 4-52-132, cephalic pores as in *G. parini*. Teeth damaged, approximately 16 on left side of upper jaw and 11+ on right; 20 teeth on right side of lower jaw, left side too damaged to count; median intermaxillary teeth 2; vomerine teeth 8.

Distribution.—Known only from Walters Shoals in the southwestern Indian Ocean. Collected from depths of 18 m by traps and by hook and line. No morays have been reported from any of the other six islands and seamounts extending along the West Wind Drift between Gough and Tristan da Cunha in the South Atlantic to Amsterdam and St. Paul in the southwestern Indian Ocean.

Etymology.—Named in honor of our distinguished colleague Nikolai Parin, an expert on the fish fauna of seamounts and scientific leader of cruise 17 of the *Vityaz*, on which all the material of this species was collected.

Comparisons.—*Gymnothorax parini* is one of several similar species occurring around islands in the subtropical zone of the southern Indo-Pacific region that have a prominent white margin on the anal fin and sometimes on the dorsal fin.

Gymnothorax woodwardi McCulloch, from Western Australia, is the closest geographic neighbor of *G. parini*, and the only species in this group that is known from the Indian Ocean. Unlike *G. parini*, *G. woodwardi* has the posterior nostril entirely posterior to a vertical line through the anterior margin of the eye. The color pattern of this species differs in that the trunk pigmentation consists of dark reticulations on a lighter background, confined mainly to the dorsal half, changing to a series of irregular bar-like markings on the tail. The white margin is prominent on the anal fin and on most of the dorsal fin, but the submarginal dark band is only weakly developed. There are 132-139 vertebrae. Two syntypes (AMS I.12224-5) have 4 predorsal, 56-58 preanal, and 135-137 total vertebrae, MVF 4-57-136.

Gymnothorax annasona Whitley occurs at Lord Howe Island and Middleton Reef, both on the Lord Howe Rise. Its snout is somewhat shorter and deeper than that of *G. parini*, the anterior nostril is slightly

shorter, and the posterior nostril is located entirely over the eye. The basal part of the anal fin is patterned, and the body color is different, consisting of moderately large spots separated by a densely speckled matrix. The holotype (AMS IA.6867) has 58 preanal and 133+ total vertebrae (tail tip missing); two other specimens have 4, 56–57, 141–143.

Gymnothorax nubilus (Richardson), from Norfolk Island, differs primarily in color. Its body is brown (a rich, chestnut color in the small specimen examined by us) with irregular cloud-like markings of darker brown, more or less conspicuous. There are three conspicuous dark streaks on the throat, the dorsal one running posteriorly from the corner of the mouth; a midventral streak is also present. The dorsal and anal fins have a dark submarginal band basal to the white edge. The holotype (BMNH 1972.1.26.159) has 3-52-132 vertebrae. Ayling & Cox (1982: 92, pl. 6) reported this species from northern New Zealand, but their description and illustration suggest that it may not be identical to the *G. nubilus* of Richardson.

Gymnothorax eupterus (Günther), from Raoul Island in the Kermadecs, was described as having white-margined fins and “gular folds and angle of the mouth dark brown” (Günther, 1870:123). The holotype (BMNH 1855.8.16.50) has 4-52-134 vertebrae. This seems very similar to *G. nubilus*.

Gymnothorax nasuta De Buen is known from Easter and Pitcairn islands (Randall & McCosker 1975:28). It has a shorter and less slender snout than *G. parini* and fewer vertebrae (138–139, Randall & McCosker 1975: 23). The white margin is weakly developed on the dorsal fin and around the end of the tail. The basal parts of both fins are patterned. The body is dark and speckled with small, irregular white spots, sometimes forming poorly defined patches.

Gymnothorax bathyphilus Randall & McCosker, from 250 m off Easter Island, is

light yellowish gray, with faint darker reticulations and blotches. There is a submarginal dark band on both dorsal and anal fins, but basally both fins are patterned. The dorsal profile of the snout is flatter than that of *G. parini*, which tends to be slightly convex.

Two specimens from Juan Fernandez Island (USNM 88679 and 88680, 810 and 824 mm TL) closely resemble *G. bathyphilus* but they are dark brown instead of light gray, with a few indistinct darker spots on the dorsal part of the body and darker streaks on the throat. Both specimens have fewer teeth in the upper and lower jaws than the type of *G. bathyphilus* (13–16 vs. 20–22 respectively in the upper, and 15–17 vs. 21–23 in the lower). The one intact specimen has 149 vertebrae vs. 145 in the type of *G. bathyphilus*.

One northern hemisphere subtropical species, *Gymnothorax kidako* (Schlegel) from Japan, resembles *G. parini* in body color and white-margined anal fin. In this species, however, the snout is slightly shorter, the anterior nostril is located entirely over the eye, and there are 142 vertebrae in the specimens radiographed.

Several other species have white-margined anal fins, but they either lack a white-margined dorsal fin or they have other characters that readily separate them from *G. parini*.

Of all the preceding species, *Gymnothorax parini* seems most similar to *G. nubilus* and *G. bathyphilus*. These have the most slender snouts and the most prominent white margins on the fins. Both have dark submarginal bands on the fins immediately basal to the white margins, though narrower than that of *G. parini*, which covers the entire basal portion of the anal fin. Moreover, both species have long anterior nostrils that reach the edge of the upper lip, and both have the posterior nostril located over or anterior to the anterior margin of the eye. In addition, all three have the small sensory papillae on the head set in tiny black spots

forming patterns of rows, although these are somewhat less prominent in *G. parini* than in the others.

None of the above species extends into the tropical zone and, except for *Gymnothorax woodwardi*, none occurs on the margins of continents. They seem to be elements of a fauna peculiar to subtropical islands of the southern Indo-Pacific. This whole area has been poorly sampled using methods likely to capture these eels (traps, hook and line in moderately deep water), therefore any general conclusions on biogeography would be premature. We suggest that these islands and reefs would be promising areas for future investigation.

Comparative material. — *Gymnothorax annasona*: AMS IA.6867 (holotype, 500 mm TL), Middleton Reef. AMS 17369-006 (1, 485), BPBM 1477 (1, 540), BPBM 14838 (1, 340), Lord Howe Island. *Gymnothorax* cf. *bathophilus*: USNM 88679 (1, 810) and USNM 88680 (1, 824), Juan Fernandez Is. *Gymnothorax kidako*: USNM 71825 (1, 445) and USNM 71826 (1, 540), Misaki, Japan. *Gymnothorax nasuta*: USNM 65521 (1, 652), Easter Island. *Gymnothorax nubilus*: NMNZ P.11717 (1, 287), Norfolk Island. *Gymnothorax woodwardi*: WAM 13263 (holotype, 515), Houtmans Abrolhos, Western Australia. WAM 27949-021 (3, 129–228), Jurien Bay, Western Australia. WAM 28523-001 (1, 385), Augusta, Western Australia.

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Literature Cited

- Ayling, T., & G. J. Cox. 1982. Collins guide to the sea fishes of New Zealand. Collins: Auckland, Sydney, London, 343 pp.
- Böhlke, E. B. 1989. Methods and terminology. In *Fishes of the western North Atlantic*.—Sears Foundation for Marine Research Memoir 1, Part 9:1–7.
- Collette, B. B., & N. V. Parin. 1991. Shallow-water fishes of Walters Shoals, Madagascar Ridge.—*Bulletin of Marine Science* 48:1–22.
- Günther, A. 1870. *Catalog of fishes in the British Museum*, vol. 8, 549 pp.
- Hatooka, K. 1986. Sexual dimorphism found in teeth of three species of moray eels.—*Japanese Journal of Ichthyology* 32:379–385.
- Leviton, A. E., R. H. Gibbs, Jr., E. Heal, & C. E. Dawson. 1985. Standards in herpetology and ichthyology: part 1. Standard symbolic codes for institutional resource collections in herpetology and ichthyology.—*Copeia* 1985:802–832.
- Poss, S. G., & B. B. Collette. 1990. *Scorpaenodes immaculatus*, a new species of scorpionfish (Osteichthyes: Scorpaenidae) from Walters Shoals, Iings of the Biological Society of Washington 103: 543–549.
- Randall, J. E., & J. E. McCosker. 1975. The eels of Easter Island with a description of a new moray.—*Contributions in Science, Natural History Museum of Los Angeles County* 264:1–32.

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